

AMENDMENTS TO THE SPECIFICATION

Please amend the title as follows:

~~ROLLER FOR CONVEYING~~ ROLLER FOR A PAPER WEB, OR SHEET
~~OF PAPER IN PAPER CONVERTING MACHINES~~ EQUIPPED THEREWITH
~~AND METHODS OF USE~~ CONVEYING METHOD THUS OBTAINED

~~TECHNICAL FIELD OF THE INVENTION~~

[0001] The present invention relates to the field of machines for converting paper and similar products, and in particular it relates to a paper conveying roller for machines working in this field, ~~such as~~ in particular, winding, rewinding[[,]] and interfolding machines.

[0002] In particular, the invention relates to a paper conveying roller having circumferentially a plurality of holes which[[,]] ~~connected to~~ communicate with a vacuum system, ~~allow~~ allowing the sheet or web of paper to adhere on its ~~their~~ surface.

~~DESCRIPTION OF THE PRIOR ART~~ BACKGROUND OF THE INVENTION

[0003] As is known, many machines used in the paper converting field, for example rewinding and interfolding machines, are equipped on the surface of their rollers with systems for capturing the web or the sheet of processed paper, in certain operative phases, in order to cause the paper to follow a predetermined path.

[0004] In particular, such systems are used to provide the main operations of cutting the paper, of

transferring it quickly from ~~[[a]]~~ one roller to another, ~~[[of]]~~ and final folding the same paper ~~same~~. To this object, the machines are normally equipped either with mechanical clamps or with pneumatic suction means.

[0006] In more detail, as shown diagrammatically in figures 1 and 2, in a paper conveying roller 101, of known art, the vacuum is transmitted through a plurality of longitudinal channels 102 into roller 101, causing the paper 120 to adhere selectively to the same roller surface ~~same~~ by means of a plurality of holes 103. Normally, holes 103 are arranged according to longitudinal rows with respect to the axis 104 of the cylinder (transversal with respect to the paper) since the vacuum is made selectively by distributor means. This causes a division of the roller surface into paper suction fields, i.e. where the rows of holes are enabled for suction, and into fields where the processed paper is instead freed from the roller for being for example transferred onto another roller or folded, i.e. the respective rows of holes are not enabled for suction.

[0007] In particular, the paper conveying roller is normally coupled, at an end thereof, to a bell-shaped vacuum distributor element 110 to it co-axial but whose rotation is impeded by means of suspension on ball bearings. The vacuum distributor 110 is equipped with an inlet 111 connected to the suction system of the machine and communicating with a curved opening 112 determined on the same distributor ~~same~~. More in detail, the curved opening 112 extends for a certain angle and, during the rotation of the roller about its own axis, selectively

communicates with longitudinal channels 102 and then with the respective rows of holes 103. This way, a portion of roller surface (hatched area in figure 1) is obtained in which the sheet or the web of paper is captured by suction and adheres on the roller surface.

[0008] With this system, channels 102 are at atmospheric pressure except from when they are in communication with the vacuum distributor. This causes, however, the row of holes 103, which is enabled to suction by alignment with curved opening 112, to start the suction of the sheet on the roller surface 101 only after that the air present in the respective longitudinal channel 102 has been removed. Therefore, there is a delay between the beginning of the suction in channel 102 and the moment where the portion of roller surface located at holes row 103 can actually start the suction of the paper, owing to the vacuum inertia for the presence of air channel 102 and the propagation time of the vacuum for all the holes for the length of the row of holes ~~length~~. Furthermore, as soon as channel 102 is not more enabled for suction, even if there is a delay of the vacuum to disappear, then, in any case, the vacuum is lost and the channel returns to the atmospheric pressure.

[0009] An inefficient ~~A not efficient~~ suction or vacuum by the holes, on the other hand, can affect the successive operations of the machine causing paper jamming and ~~stop of production~~ shutdown.

[0011] In order to limit this drawback it is therefore necessary:

- to limit the length of the roller and then the volume of

the chambers in it[;]]. This ~~this~~ causes a subsequent limitation in the maximum width of the paper that can be processed and then reduces productivity of the machines that have such rollers;

- starting/stopping the suction of the air channel with a vacuum advance, so that the suction in all the holes starts/stops at a predetermined moment[;]]. With ~~with~~ a vacuum advance, it is necessary to change the vacuum timing as ~~varies~~ the speed of operation of the machine varies;

- working with a high vacuum grade for reducing the time necessary for a row of suction holes to be fully operative.

[0012] As described in US 4207998 Pat. 4,207,998 paper dragging rollers also exist formed by a fixed cylinder that form a longitudinal chamber, about which a concentric roller rotates formed by a inner stiff tubular shell having a plurality of holes, and an outer resilient tubular shell[,] having a plurality of deformable holes. When contacting the paper the deformable holes are open and bring into communication the paper with the holes of the inner shell and the suction chamber, preventing the roller from sliding with respect to the paper. The sealing ability of the holes, however is limited to the contact with a web of paper and with a certain pressure, whereby this type of roller is unsuitable for applications with sheets of paper. Furthermore, it is suitable only for narrow fields of suction.

SUMMARY OF THE INVENTION

[0013] It is an object of the present invention to provide a roller equipped with suction points for conveying a web or sheet of paper in paper converting machines, such

as in particular rewinding, winding, interfolding machines, which allows ~~to provide~~ a high production rate even with a low grade vacuum grade , and at lower capital costs ~~then not much expensive with respect~~ relative to the prior art.

[0014] It is another object of the present invention to provide ~~such~~ a paper conveying roller for increasing productivity and flexibility of the machine on which it is mounted, in order to work webs or sheets of paper of different type and ~~wide enough~~ width without affecting the efficiency of the process.

[0020] Preferably, to increase the outlet speed of the air through the suction chamber, a plurality of apertures are ~~provided of apertures~~ arranged longitudinally along the second cylindrical tubular body and within the portion thereof defined by the radial boards.

[0022] Preferably, the sealing capability of the suction chamber is achieved forcing elastically the radial boards against the inner surface of the first cylindrical tubular body. This way, the necessary side sealing conditions of the suction chamber are guaranteed without that the radial boards ~~effect~~ effecting a high resistance against the relative rotation of the two cylindrical tubular bodies.

[0025] According to another aspect of the invention a method for moving a sheet or a web of paper in paper converting machines, such as rewinding machines, winders, interfolding machines, uses a paper conveying roller comprising a first cylindrical tubular body equipped with a plurality of radial holes arranged according to

substantially longitudinal rows. The method has the feature that the holes are selectively enabled for suction or ~~for~~ ~~not~~ without suction by the relative rotation between the first cylindrical tubular body and a second inner fixed co-axial body connected to a suction system through at least one opening. The relative rotation between the two bodies brings selectively in communication a suction chamber, defined between the first and the second body, with at least one of said row of holes, the chamber being defined by means of sliding sealing elements arranged between the first and the second body.

DESCRIPTION OF [[A]] THE PREFERRED EMBODIMENT EMBODIMENTS

[0029] In figures 3 and 4 a cross sectional view is shown of a roller 1 used for conveying a web or sheet of paper 20 for paper converting machines, for example, a rewinding machine, a winding machine, an interfolding machine. It comprises a first outer cylindrical tubular body 2, equipped with a plurality of radial holes 3 arranged according to substantially longitudinal rows, capable of rotating with respect to a second inner fixed body 4, co-axial to the former and connected to a suction system not shown. The second body 4, which as shown in the embodiments of figures 3 and 4 has tubular cylindrical geometry like first body 2, has a plurality of apertures 5 and two radial boards 7 at opposite sides with respect to apertures 5.